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Joseph Ives' Wagon Spring Clocks

By Lockwood Barr

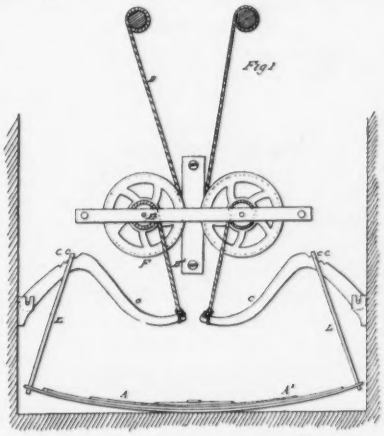
The English shelf or bracket clock of 1685-1715 was an ingenious piece of mechanism, but it was not an accurate time-keeper, judged by the precision standards set up by the tall clocks produced in the first half of the 18th Century. Their perfection of time-keeping was made possible by the development of the long pendulum and the escape mechanism, and by the fact that their driving power was the weight instead of the coiled steel spring which in those days was not dependable.

Gunsmiths skillfully tempered swords and knives. They made fine gun-locks and household hardware that required tempered flat springs. In the days of horse-drawn vehicles every carriage builder and every village blacksmith knew how to make multi-leaf flat or elliptic carriage and wagon springs. Yet the tempering of coiled steel springs, such as are used in clocks, apparently was another art. Those who knew how, guarded closely their secret and handed it down only to their sons or their favorite apprentice.

Coiled steel clock springs continued to be used without interruption, however, and through the following century there accumulated the knowledge of how to temper the steel to make coiled springs more dependable and uniform. Nevertheless the cost remained prohibitive except for the very finest watches and clocks; while the cost of the weight-driven mechanism was low in comparison.

From 1750 until the War of 1812, practically all clocks made in this country were tall clocks with long pendulums and the movements were weight-driven. After the Revolution there began to be made wall clocks and mantel or shelf clocks with brass movements having a short pendulum. These were all weight-driven. Most of the clocks of this type were eight-day time-pieces — that is, they had no strike train.

In the American Colonies few, if any, spring-driven time-pieces were made and for those that were the springs were imported. It was not



Joseph Ives' Wagon Spring Clock
(Patented 1845)

until after 1845-1850 that the New England clock industry ceased to use weights and began to adopt coiled steel springs for the driving force.

Eli Terry of Plymouth, Connecticut, received the patent in 1816 upon his 30-hour wooden movement, weight-driven, shelf clock, with its famous Scroll and Pillar case. That clock completely revolutionized and revitalized the clock-making industry of this country, because it made possible the utilization of mass production methods in a peaceful art—methods which had been used by firearms makers for nearly fifty years, both overseas and in this country. In Connecticut clock-

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Meadow Haying

By Jason Almus Russell

In early June father and I assembled the implements needed in haying-time. First there was the hay-wagon. This locally made *contrapshun*, the ancestor of the modern light truck, had been taken to pieces for the winter in order to make more room on the barn floor. It rested in parts against the partition which divided the south "bay," a deep recess in the barn for the storage of hay, from the main floor of the east barn. The body, tipped edgewise, leaned against the board wall. Nearby were the four wheels with tires "set" so often by the local wheelwright that the wheels "dished in" at an alarming angle. Finally, towering above everything else appeared the stakes and supporting framework — the former always broken and needing replacements.

Now we put the wagon together, supporting the platform, slipping on the wheels, greasing the "exes," and screwing on the elusive nuts which often slipped into a deep iron cuff with edges jagged from frequent collisions against stone gate-posts and corner buffers.

Next I placed a heavy stake upright at each corner of the wagon-body on which rested the cross-pieces and lengthwise sections, supported in turn by light-weight stakes, all known by the general name of rigging. Lastly, we added the chestnut shafts and whiffle-tree.

Such a wagon, however, was used only to bring in the hay from the upland slopes which led down to the meadow proper. Wagons, horses, mowing-machines, and horse-rakes sank into the moss and muck so rapidly that meadow-haying was always a matter of patient hand labor — wet, tedious, and backbreaking. Seldom could the hand-mower venture out without rubber boots. Hardhack (*Spi-*

raca tomentosa) and low blueberry bushes blunted the scythe, requiring frequent use of the whetstone. Black snakes, "yellowjackets," and hidden hornet nests provided many an unexpected adventure. Profusions of pogonia, cardinal flowers, and wild roses furnished beauty on every hand.

Shaking out the heavy swaths of grass with iron pitchforks was also hot work for the wilting hay literally steamed over the stagnant water. Later the hand-rakes and the bull-rakes swished the drying hay into the water a second time as we raked it into windrows. As we labored, red-winged blackbirds followed us, eating grasshoppers and ever-present aquatic bugs which fell back from the drying hay. Barn swallows skimmed low over the stubble, catching insects on the wing.

For the sloshy discomfort of hand-mowing, shaking out, raking up, and cocking the sharp-bladed hay which cut wrists and ankles, punctured bare feet, and crept inside of open-necked shirts, we were richly rewarded by the enchanting odors which rose from the marshes: horsemint, peppermint, spearmint, sweet flag, white and red spirea, pennyroyal, and a dozen other unnamed herbs.

Meadow grass seemed to contain extra moisture which made the curing process long drawn out. And not the least of our troubles consisted in moving the heavy cocks out to the dry, firm land — there to be opened up and dried once more.

For this purpose we used two smooth hardwood hay-poles, each about ten feet long, pointed at either end. Often I have stood behind the hay-cock, knee-deep in water. Father had taken his place ahead of the same cock in a similar damp and uncomfortable slough. Spacing the poles evenly and carefully, he shoved them beneath the cock and back to me. As soon as the points "hove in sight," I grabbed and guided them until they were spaced evenly beneath the cock. At a warning word we lifted upward at the same time, moved the cock "to shore" on this improvised litter, perhaps an eighth of a mile away. Ten, twenty, thirty cocks travelled out this way while the hired man raked up the "bottoms" and placed them on the cocks next in line.

In the meantime other help had brought out several baskets of haycaps. These pieces of canvas, about 4 feet by 4 feet square, had pointed stakes tied to yard-long pieces of tarred rope, fastened through brass "eyes" at all four corners.

First I placed a haycap tightly rolled up on top of each cock. Then two assistants unrolled it very evenly, taking special care to have the points an even distance from one another. Finally the pegs pulled the cap out taut. These were stuck in the ground like tent pegs, at an oblique angle to the cock. In case of rain, these caps kept the hay relatively dry for several days. Then opening up and drying the hay in the hot sun was a relatively simple matter. Drying the wet caps proved to be a more delicate process. Care was always taken to prevent mildew by spreading them out in the sun. The hay wagon could be loaded on dry land. While others pitched the hay onto the wagon, I trod layer after layer down into the four corners and the middle, placing the thin flat forkfuls, or "flakes" of hay in such a way that they would unload more readily. Many a tragedy occurred when the man "pitching on" failed to load the wagon correctly. If the horse grew weary of standing still and began to faunch around, the entire load above the stakes might slide off, carrying the man with it, and smothering him beneath its bulk or crushing him under the broad-tired wheels.

The muscular farm lad soon learned that "pitching on" and "pitching off" involved far less discomfort than loading and mowing-away; the briars did not scratch his bare feet; the "prickers" did not slip in between trousers and bare skin; the air was much fresher on the ground than on the load which had all the summer's heat beneath it.

When a "three o'clock thunder shower" growled in the northwest, the loader would place an amazingly large amount of hay on the rack until the axles creaked beneath the added burden. Nevertheless, I never knew wheel or axle to give way.

Unloading was as efficiently performed as loading. I could usually locate each forkful, pass it along to the scaffold, where a second person tossed it into the further mow, "placing" and treading furiously in order to keep on top of the dusty mass. Later when the mow was filled, I had to build a "square" extending to the top of the barn and often a stack beside the building.

If the storm had passed over without any rain following, we resumed getting in the hay until twilight forced us to stop, call the cattle from the pasture, and do the evening chores. If it rained and then the sun came out, we made a hasty trip to the nearby pond where we removed shirts and overalls, dove into the clear water, then basked in the hot afternoon sun before the evening tasks.

We found the hay-wagon handy for other uses. With sideboards fastened on each side (and fore and aft as well), we made a spring and fall trip to the sawdust pile, where we scooped up many a sack of the driest dust for winter bedding for the cattle (this in turn had fragrant meadow hay spread over it.) We shovelled the damper dust into the wagon "against" the winter ice harvest, when we used it for insulating the ice-house and for spreading thickly between the layers of ice cakes to insulate them from the summer heat.

Again, before the ground froze, we made another trip to a neighboring sandbank to get sand to fill to overflowing the big boxes placed beneath the eaves of the "linter," or lean-to. There we kept it handy for spreading on icy walks and steps.

And now hay-wagon, rakes, pitchforks, and haycaps have all gone the way of the country auction; only the haypoles, transformed into closet clothes-rods, remain to remind us of the days that used to be, when well-cured meadow hay had a definite market value and hay-poles had more than an ornamental use.

In haying time we used to chew the sweet inner husk of Sweet Flag at the base of the blade and also the somewhat acrid root. Best of all, we used to candy this root for cough medicine or colds. This was the process:

Candied Sweet Flag Root

Wash and scrape the roots. Slice thin. Cover with cold water. Bring to the boiling point and boil for two hours. Drain. Repeat the boiling until roots are tender.

The Painted Toleware of Pennsylvania

By Earl F. Robacker

The japanned tin or "tôle" ware of Pennsylvania, widely sought nowadays by collectors who cherish it for its beauty of form and naïve design, is an interesting survival of the days of hand craftsmanship. Like the chalk figurines of the early 1800's, and other manifestations of folk art with which it was contemporary, it is concrete evidence of the yearning of the common citizenry to possess objects of art without being compelled to pay art object prices for them. The process of japanning in itself was an imitative one, developing in Europe after Chinese lacquerware had been imported in quantities sufficient to make it generally known.

The painted and ornamented trays, tea caddies, coffee pots, and other small household objects as we know them today stemmed from Wales, where a mill for rolling sheet iron was erected in Pontypool in 1664. Thomas Allgood, experimenting at the ironworks of John Hanbury, developed the fine varnish which became the basic element of true japanning. His formula remained a jealously guarded family possession, his sons carrying on for many years the business developed by their father. In 1761 two of his grandsons opened a factory at Usk, and keen competition developed. Eventually, in the nineteenth century, the newer and cheaper methods of electroplating forced the japanning business to the wall.

It was the rivalry between the branches of the divided house of Allgood that was largely responsible for the fine japanned ware of Pontypool, Rhyl, and Usk, the logical progenitor of the later American product. The basic formula for the "white" or clear varnish was common family property, as was its method of application, which consisted in laying the fluid on in thin layers, each drying before the next was applied. However, the various coloring agents mixed with the varnish were secrets known only to their actual discoverers. Gold, silver, and bronze powders were mixed with the varnish for certain of the coats, with a resultant depth of tone that could not be duplicated by a rival son or cousin until after long experimentation.

For the floral decorations that were applied after the japanning itself had been completed, the services of skilled artists were requisitioned. Some of these were men who also worked for the great English potteries at some time or other, a fact which serves to explain occasional duplications in design. Such artisans frequently created, and hence owned their own designs, and apparently used them at will.

So popular were the ornamented tea caddies, candlesticks, charcoal burners, chestnut servers, kettles, and braziers turned out by the Welsh factories that eventually it became a fad among women of quality to buy plain wares and try their own hands at ornamentation, after the fashion of amateur painters on china and velvet.

The painted tin of Pennsylvania has no comparable history. Tin was scarce in pre-Revolutionary times, and sheet-tin had to be imported from England. The first manufacture of tin-plate in America is said to have been undertaken at Berlin, Connecticut, by an Irishman, one Edward Pattison or Patterson, about 1740. The methods employed at Berlin seem to have been adopted elsewhere in the country after the Pattison industry could no longer meet the growing demand.

The variety of household objects which met with so much popular favor abroad was modified by the needs of the newer country, and, instead of hot-chestnut containers and elaborate charcoal braziers, we find document boxes, apple trays, wall match boxes, measuring cups, sanders, and knitting needle cases, along with tea caddies, coffee pots, and trays, which had also been produced in Europe.

Pennsylvania tinware was cut out of flat sheets of plate with heavy shears, after which it was hammered into the desired shape with a wooden mallet. In same cases it was necessary to use a mold for this purpose. American pieces were almost always soldered, whereas Pontypool ware was usually riveted. Since pieces identical in form and shape appear in unpainted as well as in painted tin, it is probable that the actual ornamentation did not take place at the source, but rather was the work of the itinerant or "journeyman" artists of the 1800's. A comparison of the designs found in New England with those typical of Pennsylvania would seem to indicate that these men catered to purely local tastes. The tin peddler was a familiar sight in early rural communities from Maine to Florida, but he was the purveyor of bright and shiny, not painted, wares. It remained for the local artists of Pennsylvania to add the thin varnish and the colorful floral decorations which turned what might have been a Yankee product into something characteristically Pennsylvania Dutch.

A characteristic of some of the flat tôleware of Pennsylvania is an effect of crystals under the varnish. We have it on the authority of Henry K. Landis, curator of the Landis Valley Museum, that this result was obtained by painting the surface with a mixture of sal ammoniac and aquafortis, which dissolved the tin, leaving the tin-iron alloy in crystals. The surface was then quickly washed and dried, after which it was coated with varnish. The characteristic tulips, pomegranates, and other bright-hued flowers and ornamental patterns so beloved by the Pennsylvania Dutch housewives were added later. At the hands of the Pennsylvania decorators, tôleware experienced almost a complete metamorphosis, only the design of an occasional tray or tea caddy attesting to its European origin.

Curd Mould

The heart-shaped mould of tin with the pressed design was used for curds. Thick clabber was poured into the mould and the wey drained through the openings, leaving solid curd. When thoroughly dried, the mould was turned upside down on a dish and the mould iself removed. The curds would then be in shape of the design of the mould.

It should be noted that the curd mould stood on three short feet and the craftsmanship is decidedly crude. Carl Spanner, who gives this information, remembers one being used by his family as late as 1880.

The William B. Sprague Memorial Volume

The existence of THE CHRONICLE of Early American Industries Association, indeed of the organization itself, is largely due to the interest of William Buell Sprague.

We gave a review of the history of the organization in the obituary of Mr. Sprague, which was published two issues past, in December of last year. In the same issue, we announced the intention of dedicating Volume 2 to Mr. Sprague.

One of our members proposed that we print a picture of Mr. Sprague in THE CHRONICLE. This, which was a departure from our usual practice, seemed fitting and, therefore, we are happy to include, *at right*, a portrait taken of Mr. Sprague shortly before his death. Also on this page we are including four short pieces by him. These should be regarded as unfinished articles as they were left behind and were evidently in the process of work when he died.

—Blackstone Studios
20 West 57th St., N. Y.

WILLIAM BUELL SPRAGUE
Founder of Early American Industries Association

SHOEMAKING

After the materials for the shoe had been cut to proper size, with the *shoemakers' knife*, the uppers were stitched together, the inner sole hammered on the *lap stone* and the latter tacked to the *last* and trimmed. The uppers were then stretched on the last with *pincers*, fastened with tacks and then sewed to the bottom of the inner sole with waxed thread, passed through holes made with the *awl*. A narrow strip of leather, called the welt, was then fastened on by similar means, and to this is fastened the outer sole, either with thread or (between about 1820 and 1870) by wooden pegs, driven with the clawless *hammer*, the ends of which pegs were then smoothed off with the *rasp*. Until 1785 in England, and for many years after that in this country, the same last was used for the right and left shoe. Until 1840, shoemakers used the same tools as they had used in colonial days.

WEAVING

Preparatory to weaving on the large loom, the first step was to fill the spools for the warp and the shuttle bobbins or quills, for the swift. The hanks of yarn or thread were laid upon a *swift*, a reel composed of a number of "lazy tongs," which allowed it to be compressed or expanded to fit any hank. The spools and the shuttle bobbins were in turn placed upon a *grilling wheel*, the end of the yarn or thread wound upon them, and the grilling wheel revolved with great rapidity, which rapidly filled them to capacity, the swift at the same time revolving to feed the hank to the spool.

CANDLES

The most primitive method of making candles was to take pieces of wicking about twice the length of the candle desired, loop them around the *candle rods* and twist them down, several wicks being placed on each rod. All the wicks on a rod were then dipped at once into a kettle which contained the hot tallow, a certain amount of which clung to the wicks, and the ends of the rod were then rested on two crosspieces. The same thing was done with each rod in turn, by which time the tallow on the first wicks had hardened sufficiently to acquire another layer of tallow, when dipped. This process was repeated, until the candles were of the right size. Sometimes home-made *candle dippers* were used instead of the rods, and where the dipping was done on a large scale, a *candle-dipping machine* was desirable.

The use of *candle moulds* was far less complicated.

TO CLEAN OR NOT TO CLEAN

To what extent specimens should be left in their state when acquired is not so difficult of determination. Rust is certainly no proof of antiquity, in fact it often conceals conclusive evidence to the contrary. Wooden articles are almost always improved in appearance by a thorough cleansing with soap (not too strong) and water. The aim should be to restore the article to its state when in active use. To treat wood with oil, varnish or shellac, however, will spoil its appearance to the discerning. Supplying a handle to a tool which lacks one is scarcely legitimate restoration, and seldom is satisfactory. On the other hand, to replace a minor but essential part in order to perfect the mechanism of a machine which otherwise would not function seems fairly permissible.

Index for Volume II

The war definitely means a curtailment of most normal activities of civil life. This curtailment affects likewise many cultural efforts which have a lasting value to the country as a whole. Early American Industries Association will probably have to give up formal meetings of its members for the duration. It may be later necessary to also curtail the size of THE CHRONICLE. We plan, however, to continue THE CHRONICLE as rapidly as pertinent material is submitted for publication.

As always, the problem is to obtain articles pertaining to the tools and the processes of industry of our early American industries, and the Editor would appreciate all members writing him of any likely articles or items, small or large, of factual interest which should be saved for publication.

When Volume I was completed, an index was issued for it at the cost of one dollar. Copies of this are still available. With Volume II now completed, consideration is being given to preparing an index for it. This may have to wait the duration, however. Notices will be sent to members when and if this work is completed.

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Communications should be addressed as follows: Pertaining to the *contents* of THE CHRONICLE to Mr. Hatch. Suggestions for prospective members to Mr. Bacon. Other matters, to Mr. Lane. Addresses as here given.

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Our Purpose

The purpose of the corporation is educational, to encourage the study and better understanding of early American industry, in the home, in the shop, on the farm, and on the sea, and especially to discover, identify, classify, preserve and exhibit obsolete tools, implements, utensils, instruments, vehicles, appliances and mechanical devices used by American craftsmen, farmers, housewives, mariners, professional men and other workers.

Dues

The annual dues are payable January 1st, beginning 1943, and are as follows: Regular members, $1.00; Contributing members, $2.00; Supporting members, $5.00; Sustaining members, $10.00 and up. There is no distinction between the classes, except the amount of dues, but the publication of THE CHRONICLE cannot be financed unless a considerable number of the members pay more than $1.00. Each member is expected to voluntarily place himself in the class which represents the amount he is willing to contribute to the support of the Association for the current year. Life membership costs $50.00. THE CHRONICLE is sent to all members without additional charge. Many of the back numbers may be secured from the Treasurer for from 20c up, according to the supply on hand, and a twelve-page index to the twenty-four numbers of Volume I, containing a useful bibliography, for $1.00 each. For further information, address any of the officers.

Albany Meeting

Members of Early American Industries Association held an informal early summer meeting jointly with the Albany County Historical Association at the Albany Institute of History and Art, Albany, N. Y., on Saturday, June 26, 1943.

Warren C. Lane, President of the Association, opened the meeting at 10:15 A.M., introducing Mr. Hatch, who was Chairman of the Program Committee, as presiding officer.

Mr. Cogswell, President of the Institute before reading his paper on Albany and its Early Industries, extended a welcome to members of the Association and visitors. His talk was illustrated with slides from his own collection of views of the city.

Basil Kievit next spoke on the construction of covered bridges in Upper New York State, showing their structural development and in reviewing the large number of covered bridges in Upper New York State spoke extensively on their design. His talk was illustrated with a large exhibition of mounted and documented photographs from his collection.

Laurence Fenner spoke on brick making in the Hudson Valley. Bricks were made in the Hudson Valley from the 17th Century and are today being manufactured with much the same processes as were used in earlier times. A lively period of discussion and questions followed.

The Chairman, Mr. Hatch, then spoke for Mr. Chris Schupp, who had loaned a large number of forged tools, spokes, and several early models of cutters and wagons for the occasion, which had been manufactured by the Schupp Carriage Works.

Albany has remaining two carriage companies which were active in the early part of the last century — the Gould Carriage Works, which made the first Mohawk and Hudson Railway carriages, and the Schupp Auto Works, established by the father of Chris Schupp.

Before proceeding to lunch at the nearby University Club, members had an opportunity to study the collections of the Albany Institute. In the early afternoon, members visited the newly opened history and art rooms in the State Museum, being given personal guidance through the museum and through the study collections by Dr. C. C. Adams.

In recording this meeting mention should be made of a dinner for the Board the night preceding and the official meeting of the same group at breakfast on Saturday morning before the Association gathering.

Mention should also be made of the special evening showing arranged to coincide with the meeting by the Albany Cinema Guild at the Albany Institute of two early pictures — "The Great Train Robbery," first feature movie, and "The Hunchback of Notre Dame" with Lon Chaney. Musical accompaniments were played with this showing by Walter Simon, first composer of musical scores for moving pictures, who had also published scores for the Hunchback and other early pictures.

Board Meeting

At the meeting of the Board, held in Albany, June 26, 1943, Mr. Lane, as President, spoke on the double future of the organization: (1) Developing the educational value of Early American Industries and the potential importance of these in our national American life, and (2) encouraging the collection and preservation of early tools.

Dr. C. C. Adams, Librarian of the Association, suggested that the Association has changed today and that the collector was important but the research value of the organization had, under definite guidance, become one of its most valuable aspects. Dr. Adams moved a committee be appointed to study and report at a later meeting of the future of the organization.

Allan Eaton suggested the Association might offer instruction on the saving of early materials which was generally agreed might be made an introduction to the subject of Early American Industries.

Charles E. Ayers indicated that a new group of research workers was needed.

Mr. Hatch called attention to the careful direction which the Association had been given by Mr. Sprague, that is, the emphasis on the *processes* of early American industries and the *tools* used in these processes, rather than the products.

The Treasurer, George Simmons, expressed regret that because of neces-

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The Chronicle

Joseph Ives' Wagon Spring Clocks

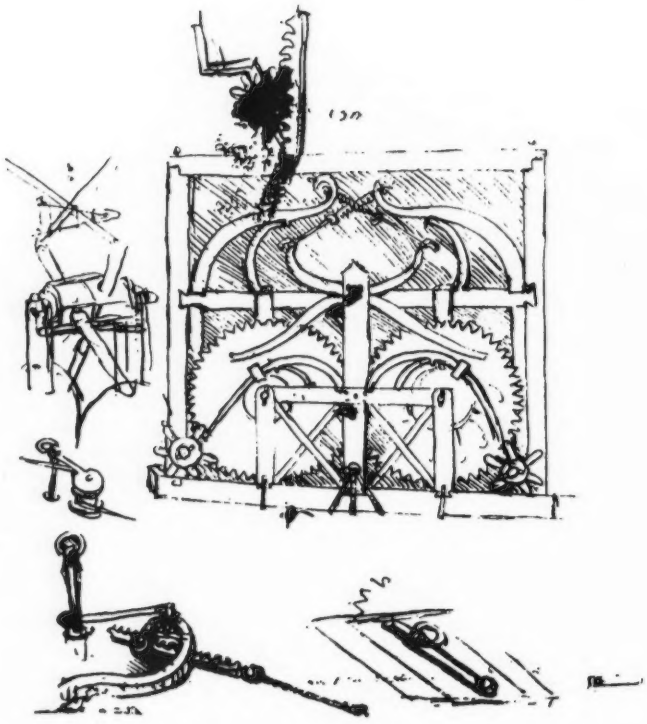
(*Continued from page 207, column 2*)

makers sprang up almost overnight in every town and hamlet and they pirated the plan of Terry's new wooden clock movement, and copied the design of the case — completely disregarding Terry's patent rights. Thousands upon thousands of these Yankee wooden movement shelf clocks were made in the ten-year period, 1816-1826.

Joseph Ives (1782-1862) of Bristol, Connecticut, was one of the pioneer New England clockmakers and a most ingenious inventor, with many patents to his credit. He was not a good business man nor a successful manufacturer, so his inventions and patents he licensed to others for use. When Eli Terry patented his 30-hour wooden movement shelf clock, Joseph Ives believed he could make a simple spring-driven attachment that could be attached inside the bottom of the case of these Terry clocks to take the place of the weights. He soon accomplished what he set out to do—but there were "bugs" in his mechanism and so he did not go into production upon his early models. One of these models attached to a Terry-type wooden movement housed in a typical Scroll and Pillar case is now owned by Howard Palmer of Westerly, Rhode Island.

Had Joseph Ives before 1820 been able to perfect his spring-driven power plant attachment for the Terry-type clocks, he would have reaped a fortune, since so many clocks of this type were in daily use. Never being satisfied with anything short of the ultimate, Joseph Ives continued until his death in 1862 to improve and make more dependable his spring driven power plant. When it was perfected there was no demand for it. Metal clocks had superseded wooden movement clocks. By 1845-1850 methods of making and tempering coiled steel springs had been developed in New England and the costs of these coiled steel springs were so low that the Ives' mechanism could not compete.

That mechanism which was developed by Ives was unique in the annals of clockmaking. It is now commonly called the "wagon spring" because it was a flat multi-leaf spring—a miniature of the old-fashioned wagon spring. Ives named it the Patented Accelerating or Lever Spring. In its final form it was used to drive brass movement 30-hour, eight-day, and 30-day or month clocks — the 30-day type being so accurate and such dependable time-pieces they were built as jeweler's regulators.



Portion of a Page in Leonardo Da Vinci's Note Book Showing Wagon Spring Principle

It would be interesting to know just what gave Joseph Ives the idea for his invention, for the function of a wagon spring was to absorb the force from a blow, or to cushion the vehicle and its passengers from the shocks of the rough road. The principle of the bow and arrow has been known by all peoples back to the dawn of history. What Joseph Ives finally developed was not unlike the 13th Century Cross Bow, which had several flat steel leaves one on top of the other, so powerful that it required a geared winding mechanism not unlike the winding mechanism of a clock. However, unlike the bow, which delivered one sharp blow, the Ives mechanism produced a steady stream of power.

The Ives wagon spring mechanism in its perfected form consisted of a heavy inverted U-shaped steel base. The flat multi-leaf wagon spring was anchored to this base by a large bolt through the middle of the spring. The ends were free. On either side of the U-base was attached heavy cast iron frames. At the top of the frames the clock movement was seated. Attached to the free ends of the flat multi-leaf spring were jointed links which wrapped around cams mounted above in the frame on pinions. Fastened to each of these cams was a lever. From the ends of the levers went small chains (replicas of bicycle chains) which wrapped around the axles of two large wheels set above in the cast iron frame. The outer face of these large wheels were grooved for cords that were attached to the winding arbors of the clock movement.

The arbors in the clock movement when wound with a key drew the cords off of the two large wheels and thus caused them to revolve. The large wheels revolving caused the bicycle chains to wrap themselves around the axles of these wheels. The ends of those bicycle chains being attached to the two levers caused the levers to rise. The levers being fixed to the cams caused the cams to revolve which made the jointed links wrap

around the cam; and the jointed links attached to the free ends of the spring, cause the two free ends of the spring to rise up into the form of a bow.

When fully wound up the short multi-leaf spring produced an enormous pull. As the clock ran and the spring came back towards its flat position, the power of the spring decreased. To compensate for the decreasing spring pressure, the angle of the levers constantly changed, so that as the levers lowered themselves they increased the power of leverage in exactly the proportion of the decreasing spring pressure. The result was that for 30 days the pressure delivered by the cords wrapped around the winding arbors in the movement of the clock was uniform and equal at all times. That was a remarkable mechanical achievement!

In 1825-1830 Joseph Ives located in Brooklyn, New York, where he made eight-day brass clocks operated by this wagon spring mechanism. Either few were made or very few specimens have survived, for at the present only three of those clocks are known to exist. Between 1843-1847 the firm of Birge & Fuller, Bristol, Conn., working under an agreement with Ives, made his patent wagon spring clocks with 30-hour and eight-day brass movements. They turned out a large quantity of such clocks so that these wagon spring clocks are not uncommon today; and still are satisfactory time-keepers.

Between 1850 and 1856 the firm of Atkins, Whiting & Co., Bristol, were making 30-day wagon spring regulator time-pieces for jewelers, using Ives' patents. There were not very many of these clocks produced and while the twenty-five or thirty specimens now known to exist are all similar in their fundamental plan, each differs from the other in some detail, indicating that Joseph Ives was still experimenting in his search for final perfection. Even after eighty years of use and abuse these 30-day clocks keep perfect time. On this wagon spring mechanism he secured his final patents in 1859. He died in 1862 and nothing further was done with these patents and developments. The cheap, dependable, coiled steel clock spring had been perfected and this very expensive wagon spring mechanism could not compete in spite of its superiority. And thus it came to an end.

Search into the history of manufacturing methods and mechanical principles fail to show the application of this wagon spring principle in industry either before or after Joseph Ives' era.

It is an amazing fact, however, to discover that Leonardo Da Vinci (b. 1452, d. 1519) in his sketch book made very clear and complete working drawings for a horseless carriage, the motive power for which was almost identical with that used by Joseph Ives in his finally perfected 30-day wagon spring clock. There is nothing to indicate that Da Vinci ever built his horseless carriage, or that he used this principle in his other inventions.

In many of his inventions Da Vinci anticipated by nearly 400 years inventions we think of as the development of the present-day machine age.

In his horseless carriage Da Vinci incorporated not only the driving force of the flat multi-leaf flat spring, but he also introduced the Differential and the Transmission—mechanisms essentil to present-day motor cars — inventions generally attributed to the creative genius of automotive engineers of this century. It is also amazing to discover that the Rolling Pinion was used by Da Vinci instead of the small gear with leaves — commonly known as the Bull Gear — to take up excessive pressures and reduce friction. Da Vinci evidently constructed any number of machines for different purposes and in many of these he actually used the Roller Pinion instead of the small Bull Gear or Pinion. The principle was utilized in the beginning of modern anti-friction roller bearings now so commonly used in all forms of heavy machinery and in motor cars.

Joseph Ives probably never heard of Leonardo Da Vinci except as a great artist. Certainly he had never seen those sketch books of Da Vinci and could not have known of Da Vinci's efforts to utilize these two unique principles of mechanics 300 years before he, Ives, was born. It is a strange coincidence that Ives introduced the Rolling Pinion in his wooden clock movements as early as 1810-1812 to overcome excessive pressure and reduce friction losses, and he secured a patent upon his development in 1834 of Roller Pinions of brass. Joseph Ives licensed a number of Connecticut clockmakers to produce brass clock movements utilizing inventions and improvements centering around his Rolling Pinion patents of 1834.

The use of these Roller Pinions continued quite commonly in the clock industry until around 1850-1860. The form was then altered but the clockmakers still use what is now known as the Lantern Pinion, the principal difference being that the round wires which form the "leaves" are now fixed rigidly into the flat rings instead of being free to revolve in the flat rings as in the Ives patent.

Colonial Volunteers

Their Trades and Occupations

Compiled by S. H. P. Pell, *Fort Ticonderoga*

Apothecary
Baker
Barber
Barber and Wig Maker
Bells Maker
Black Smith
Block Maker
Book Binder
Boulter & Baker
Brasier
Brass Founder
Breeches Maker
Brewer
Brick Layer
Brick Maker
Breekler (Breeches Maker)
Brown Smith (Copper Smith)
Butcher
Button Maker
Callender (Paper Maker)
Callico Maker
Caner (Caned chairs)
Capper
Carman
Carpenter
Cart Maker
Chair Maker
Chocolate Maker
Clerk
Clothier
Coach Maker
Cobler
Collier
Cook
Cooper
Copper Smith
Cord Wainer
Cord Winder
Crosser (Cross Maker)
Currier
Distiller
Ditcher
Doctor
Doctor of Physic
Dyer
Farmer

COMMUNICATIONS

Fell Monger
(Bell Monger?)
Fencing Master
Ferrier
(Black Smith)
Fiddler
Flax Teaser
Forgeman
Founder
Fuller
Gardener
Gentleman
Glass Maker
Glazier
Glover
Gold Smith
Grocer
Groom
Gunner
Gun Smith
Hatter
Halter
(Halter Maker)
Hedger
Hosier
House Carpenter
Husbandman
Inn Keeper
Iron Refiner
Joiner
Labourer
Lace Maker
Leather Breeches
Maker
Leather Dresser
Limner
(Portrait Painter)
Marriner
Mason
Merchant
Miller
Mill Wright
Miner
Mohair Maker
Moulder
Nail Maker
Oyle Maker
Painter
Panor
(Window Panes)
Paper Maker
Peddler
Peruke Maker
Pewterer
Pipe Maker
Pit Sawyer
(Board Maker)
Potter
Poulterer
Printer
Quack Doctor
Reed Maker
Refiner of Iron
Ribbon Weaver
Rope Maker
Roper
Saddler
Saier (?)
Sailer
Sail Maker
Sawyer
School Master
Scribler
Scrivener
(letter writer)
Seaman
Shingle Maker
Ship Builder
Ship Carpenter
Ship Caulker
Ship Wright
Shoe Maker
Shop Joiner
Silk Weaver
Silk Dyer and
Scourer
Silver Smith
Slater
Sleigh Maker
Smith
Smuggler, An Old
Soap Boiler
Soldier
Spinner
Stay Maker
Stocking Weaver
Stone Cutter
Sugar Baker
Surgeon
Sweep Chimney
Tallow Chandler
Tanner
Tanner and Currier
Taylor
Tinker
Tinn Man
Tobacconist
Turner
Upholsterer
Vintner
Vitualler
Waggon Maker
Wampum Maker
Waterman
Watch Maker
Weaver
Wey Maker (?)
Wheel Wright
White Smith
(Silver Smith)
Wig Maker
Woolen Weaver
Wool Carder
Wool Comber
Wool Spinner
Yeoman

From Miss Emilie Sarter:

In copying the will of an ancestor who died in 1761, I find he bequeathed to his son his "Roping Geer, so-called." Can you help me to determine what kind of machinery or equipment this was?

Hotel Taft,
New Haven, Conn.

To the Editor:

I have been studying the subject of the painted tin- or tôle-ware of the Pennsylvania Germans for a long time,—during the time, in fact, that my wife and I have been building up our collection of it. We have, I think, all the known forms, colors, and designs of this ware.

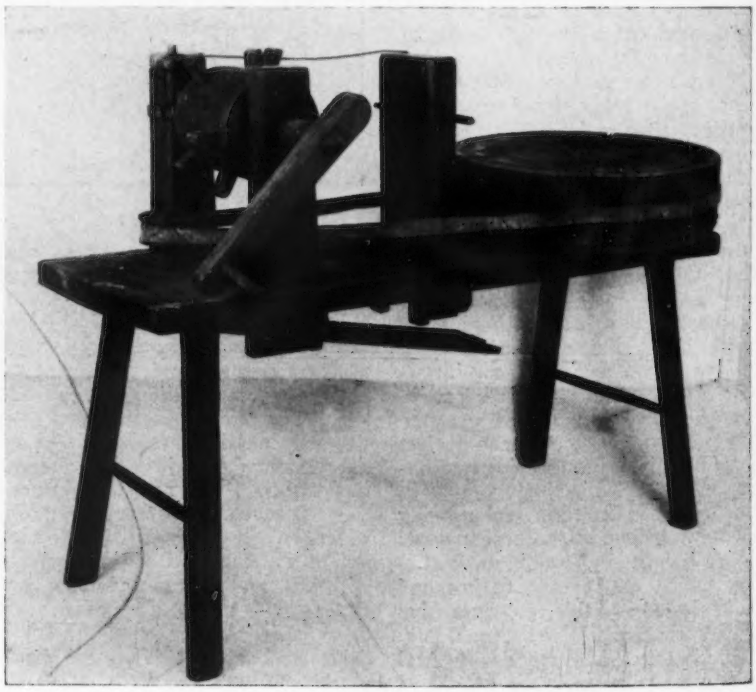
I have talked with a great many people and museum curators about the stuff, in addition to reading Antiques, Antiquarian, Bishop, Bond, and Wright. None of them has as yet been able to report a single name or maker in connection with this Pennsylvania ware, or of a known decorator. Do you have any information on this subject?

Dr. Earl F. Robacker

From Clifford L. Lord:

I am sending you this picture of a what-is-it? for The Chronicle. Can any of our members help to determine what it is?

New York State Historical Assn.,
Cooperstown, N. Y.



What Is It?

Board Meeting

(*Continued from page* 211, *column* 3)

sary war duties it would not be possible for him at the present time to continue actively as Treasurer. His resignation was accepted with regret by the President, who indicated that he would ask Mrs. Pierce to undertake, until the next regular members' meeting, the joint position of Secretary-Treasurer. This, up to the present year, was the manner in which these two offices had been handled.

After discussion at length as to the value of The Chronicle and its format, the discussion was carried over to a future meeting.

From N. R. Ewan:

"We have in our Camden museum a relic from a South Jersey still known as a 'Thief.' This glass instrument, about 7 inches long, was used as a sampler. Inserted through the bung-hole of the barrel, it was immediately submerged by the weight of its lower end and the hollow upper portion then held sufficient liquid when withdrawn to compensate for a modest drink."